Kim

Please file

Thanks, SMS

Preliminary Geotechnical Investigation

Harbor Gateway Center
Normandie Avenue and West 190th Street
Los Angeles, California

NorCal Engineering
Soils and Geotechnical Consultants

Preliminary Geotechnical Investigation

Harbor Gateway Center
Normandie Avenue and West 190th Street
Los Angeles, California

Project Number 5936-96
March 18, 1996

NorCal Engineering

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS
10641 HUMBOLT STREET LOS ALAMITOS, CA 90720
(310) 799-9469 FAX (310) 799-9459

March 18, 1996 Project Number 5936-96

McDonnell Douglas Realty Company
4060 Lakewood Boulevard
Lakewood, California 90808

Attn. Mr. Mario Stavale

Re: **Preliminary Geotechnical Investigation** - Proposed Harbor Gateway Center - Industrial and Retail Development - Located at the Southwest Corner of Normandie Avenue and 190th Street, in the City of Los Angeles, California

Dear Mr. Stavale:

Pursuant to your request, this firm has performed a Preliminary Geotechnical Investigation for the above-referenced property in accordance with your authorization of our proposal dated January 3, 1996. The purpose of this investigation is to evaluate the geotechnical conditions of the subject site and to provide recommendations for the proposed industrial and retail development. This geotechnical engineering report presents the findings of our study along with conclusions and recommendations.

We appreciate this opportunity to be of service to you. If you have any further questions, please do not hesitate to contact the undersigned.

Respectfully submitted,
NORCAL ENGINEERING

Keith D. Tucker
Keith D. Tucker No. 841
Project Engineer
R.G.E. 841

Troy D. Norrell
President

Introduction

This geotechnical engineering report presents the findings of our study along with engineering analysis and preliminary recommendations for a proposed industrial and retail development on an approximately 170.2 acre site located at the southwest corner of Normandie Avenue and 190th Street in the City of Los Angeles. The purpose of this investigation was to determine the geotechnical conditions of the subsurface soils underlying the site in order to provide general recommendations for the proposed future development.

Information contained in this report has been compiled from a site reconnaissance of the property, subsurface exploration and soil sampling, laboratory testing and engineering and geological analysis. An undated aerial photograph, topographic maps of the facility and a land title survey plan prepared by Tait and Associates Inc., dated February 14, 1996, were used as references for this investigation. A preliminary site plan prepared by Phillips Brandt Reddick, Inc. dated February, 1996 was incorporated as the site plan of this study. In addition, a review of groundwater contour maps by the County of Los Angeles Department of Public Works and United States Geological Survey (USGS) Topographic Maps was also performed.

Proposed Development

It is understood that the proposed construction will consist of an industrial park development for the planned Harbor Gateway Center project. This development will consist of several office warehouse and retail buildings with associated interior street and landscape areas. It is anticipated that the proposed industrial buildings will probably consist of one to two story concrete tilt-up structures with slab-on-grade floors. Grading and foundation plans have not been made available at this time; however, it is recommended that building plans be reviewed by this office when they become available to determine if additional study or revised recommendations are pertinent for the proposed development as deemed necessary.

Site Description

The irregular L-shaped subject parcel is approximately 170 acres in area and is bounded on the north by 190th Street, residential dwellings on 203rd Street and an industrial facility to the south, Normandie Avenue and railroad spur to the east and the abandoned operations of the Industrial Light Metals facility, an operating Capital Metals facility and Western Avenue to the west. The topography of the site is relatively level with a maximum relief of a few feet in a south to north direction.

The property is currently occupied by the McDonnell Douglas - Torrance facility, an aircraft manufacturing plant which is in the process of abandoning operations. The site consists of several large metal with steel girder and masonry brick buildings within the northerly portion of the parcel which were constructed sometime between the early 1940's and mid 1960's. Some of the buildings were observed to have localized underground pits and subterranean equipment. The remaining area around the buildings is paved with concrete and asphalt pavement. The southerly portion of the parcel is occupied by a storage equipment yard with several railroad spurs for loading and unloading access. A majority of this storage area is covered at the surface with gravel. Access into the facility is provided from an interior street extending from 190th Street.

Field Investigation

The investigation consisted of the placement of fifteen subsurface exploratory borings to a maximum depth of 50 feet with a truck-mounted 2800HS hollow stem auger strategically placed throughout the property. The explorations were visually classified and logged by a field engineer and logs of the borings are attached in Appendix A. Locations of the subsurface explorations are shown on the Site Plan. Representative soil samples were recovered and transported to our laboratory for analysis and testing. The exploratory borings revealed the existing earth materials, including artificial fill and natural soil zone. These strata are described as follows:

Artificial Fill: A fill soil was encountered to an observed depth ranging from 1 to 4 feet below ground surface consisting of a dark brown to brown silty CLAY to a yellowish brown clayey SILT which were noted to be soft to stiff and moist to very moist. A pavement section consisting of an asphalt pavement overlying a layer of base material A few of the borings were observed to contain some minor gravel and small pieces of asphalt and brick.

Natural: A native and undisturbed alluvium soil consisting predominately of a dark brown to brown silty CLAY to a yellowish brown clayey SILT which were generally stiff and moist was encountered beneath the fill. A stiff sandy SILT was observed below 12 feet with a dense fine grained silty SAND encountered from 23 feet to about 42 feet below ground surface.

The overall engineering characteristics of the earth material were relatively uniform with each boring. No groundwater was encountered to the depth of our borings and no caving occurred.

Laboratory Tests

Relatively undisturbed samples of the subsurface soils were obtained to perform laboratory testing and analysis for direct shear, consolidation tests, and to determine in-place moisture/densities. These undisturbed samples consisted of one inch rings with inside diameter of 2.5 inches. Bulk bag samples were obtained in the upper soils for expansion index tests, maximum density tests and sulfate analysis. All test results are included in Appendix B.

A. The field moisture content (ASTM: D2216) and the dry density of the ring samples were determined in the laboratory. This data is listed on the log of borings.

B. Maximum density tests (ASTM: D1557-78) were performed on typical samples of the upper soils. Results of these tests are shown on Table I.

C. Sieve analyses (ASTM: D422-63) and the percent by weight of soil finer than the No. 200 sieve (ASTM: 1140) were performed on selected soil samples in order to assess liquefaction potential.

D. Expansion index tests in accordance with the Uniform Building Code Standard No. 29-2 were performed on remolded samples of the upper soils to determine the expansive characteristics and to provide any necessary recommendations for reinforcement of the slabs-on-grade and the foundations. Results of these tests are provided on Table II.

E. Soluble sulfate tests in accordance with EPA Method 9038 were performed on representative soils samples to estimate the potential for corrosion of concrete in contact with the on-site soils. Results are attached on Table III.

F. Direct shear tests (ASTM: D-3080) were performed on undisturbed and disturbed samples of the subsurface soils. These tests were performed to determine parameters for the calculation of the safe bearing capacity. The test is performed under saturated conditions at loads of 500 lbs./sq.ft., 1,000 lbs./sq.ft., and 2,000 lbs./sq.ft. with results shown on Plates A and B.

G. Consolidation tests (ASTM: D-2435) were performed on undisturbed samples to determine the differential and total settlement which may be anticipated based upon the proposed loads. Water was added to the samples at a surcharge of one KSF and the settlement curves are plotted on Plates C and D.

Conclusions and Recommendations

Based upon our evaluations, the proposed development is acceptable from a geotechnical engineering standpoint. By following the recommendations and guidelines set forth in our report, the structures will be safe from excessive settlements under the anticipated design loadings and conditions. The proposed development shall meet all requirements of the City Building Ordinance and will not impose any adverse effect on existing adjacent structures. The following sections present a discussion of geotechnical related requirements for specific design recommendations of different aspects of the project.

Seismicity Evaluation

The site is located within the broad alluvial plain consisting of undifferentiated late Holocene alluvium deposits. There are no known active or potentially active faults trending toward or through the site. The proposed development lies outside of any Alquist Priolo Special Studies Zone and the potential for damage due to direct fault rupture is considered remote. The site is located in an area of high regional seismicity and a maximum credible bedrock acceleration of 0.52g may occur from a Magnitude 6.6 event along the Palos Verdes Hills fault zone which is located approximately 3 miles away to the southwest. Ground shaking originating from earthquakes along other active faults in the region is expected to induce lower horizontal accelerations due to smaller anticipated earthquakes and/or greater distances to other faults. The following table provides information on nearby major active faults along with peak horizontal ground accelerations.

Estimated Maximum Probable Ground Motion Parameters

Fault Zone	Approximate Distance from Site (miles)	Maximum Probable Magnitude	Peak Horizontal Acceleration (g)
Palos Verdes Hills	3 SW	6.6	0.52
Newport-Inglewood	5 NE	6.6	0.42
Whittier	18 NE	6.7	0.25
San Andreas	48 NE	8.1	0.15

Modified from Wesmousky (1986), and Ziony (1985)

Liquefaction Potential

The subject site is expected to experience ground shaking and earthquake activity that is typical of Southern California area. It is during severe ground shaking that loose, fine grained soils below the groundwater table can liquefy. A review of the exploratory boring logs and the laboratory test results on selected soil samples obtained indicate the following soil classifications, field blowcounts and amount of fines passing through the No. 200 sieve:

Location	Classification	Field Blowcounts (blowcounts/ft)	Density	Amount Passing No. 200 Sieve (%)
B-5 @ 5'	ML	36	Stiff	63
B-5 @ 10'	CL	19	Stiff	86
B-5 @ 15'	CL	23	Stiff	81
B-5 @ 20'	ML	21	Stiff	60
B-5 @ 25'	SM	59	Dense	40
B-5 @ 30'	SM	39	Dense	30
B-5 @ 35'	SM	59	Dense	19
B-5 @ 40'	SM	61	Dense	25

Our analysis indicates the potential for liquefaction at this site is considered very low due to the stiff nature of the clayey and silty soils. The groundwater depth in the vicinity is about 80 to 90 feet based upon review of the groundwater contour map dated Fall 1993 by the County of Los Angeles Department of Public Works. In addition, the potential of liquefaction is considered low as documented by the USGS Professional Paper 1360, Evaluating Earthquake Hazards in the Los Angeles Region, Figure 143.

Thus, the design of the proposed construction in conformance with the latest Building Code provisions for earthquake design is expected to provide mitigation of ground shaking hazards that are typical to Southern California.

Site Grading Recommendations

Any vegetation and demolition debris shall be removed and hauled from the site prior to the start of grading operations. The upper existing fill soils (upper 1 to 4 feet) shall be removed to competent native soils, exposed surface scarified, moisture conditioned and recompacted to a minimum of 90% of the laboratory standard (ASTM D1557-78) prior to placement of any additional compacted fill soils, slabs-on-grade or pavement. In addition, overexcavation shall extend a minimum of five horizontal feet or to the depth of compacted fill placed, whichever is greater, beyond all sides of the foundations.

It should be noted that depth of overexcavation may exceed the above referenced depths due to isolated areas of as yet undiscovered low density soils. A diligent search shall be conducted during grading operations in an effort to uncover any underground structures or utility lines. If found, these structures and lines shall be either removed or properly abandoned prior to the proposed construction.

Any removed soils may be reutilized as compacted fill once any deleterious material or oversized materials (in excess of eight inches) is removed. All grading operations shall be performed in accordance with the attached "Specifications for Compacted Fill Operations".

Any imported fill material should be low to moderate in expansion potential, preferably granular or similar to the upper soils encountered at the subject site. All soils shall be approved by this firm prior to importing at the site and will be subjected to additional laboratory testing to assure concurrence with the recommendations stated in this report.

Care should be taken to provide or maintain adequate lateral support for all adjacent improvements and structures at all times during the grading operations and construction phase. Adequate drainage away from the structures, pavement and slopes should be provided at all times.

Shrinkage and Subsidence

Result of our in-place density tests reveal that the soil shrinkage will probably be on the order of 20% due to excavation and recompaction, based upon the assumption that the fill is compacted to 92% of maximum dry density per ASTM standards. Subsidence should be 0.2 feet due to earthwork operations. The volume change does not include any allowance for vegetation or organic stripping, removal of subsurface improvements or topographic approximations. Although these values are only approximate, they represent our best estimate of lost yardage which will likely occur during grading. If more accurate shrinkage and subsidence factors are needed, it is recommended that field testing using the actual equipment and grading techniques should be conducted.

Temporary Excavations

Temporary unsurcharged excavations in the existing site materials less than 5 feet high may be made at a vertical gradient unless cohesionless soils are encountered. Temporary unsurcharged excavations from 5 to 10 feet high may be trimmed at a 1/2 to 1 (horizontal to vertical) gradient. In areas where soils with little or no binder are encountered, where adverse geological conditions are exposed, or where excavations are adjacent to existing structures may require shoring, slot-cutting, or flatter excavations. The temporary cut slope gradients given do not preclude local raveling and sloughing. All excavations shall be made in accordance with the requirements of CAL-OSHA and other public agencies having jurisdiction.

Excavations placed adjacent to the neighboring structures for grading or new foundations may need be made utilizing the A-B-C slot-cut procedure, whereby 10 feet long sections of soils adjacent to the existing structure are alternately excavated and recompacted or footings placed prior to excavation in the subsequent slots. Slot-cuts shall be made in sections no greater than 10 feet in length and 10 feet in height and shall be observed by the geotechnical engineer. The finalized grading plan shall be reviewed by this firm to provide a more accurate recommendation regarding excavation along property line.

Foundation Design

All foundations may be designed utilizing the following safe bearing capacities for a embedded depth of 18 inches into approved compacted fill soils with the corresponding widths:

Allowable Safe Bearing Capacity (psf)

Width (ft)	Continuous Foundation	Isolated Foundation
1.5	1500	2000
2.0	1575	2075
4.0	1875	2375
6.0	2000	2500

A one third increase may be used when considering short term loading from wind and seismic forces. All continuous foundations shall be reinforced a minimum of one #4 bar, top and bottom. Isolated foundations shall be reinforced at the discretion of the project structural engineer.

Lateral Resistance

The following values may be utilized in resisting lateral loads imposed on the structure. Requirements of the current Uniform Building Code should be adhered to when the coefficient of friction and passive pressures are combined:

Coefficient of Friction - 0.35

Equivalent Passive Fluid Pressure = 200 lbs./cu.ft.

Maximum Passive Pressure = 2,000 lbs./sq.ft.

The passive pressure recommendations are valid only for competent native material and/or compacted fill soils.

Settlement Analysis

Resultant pressure curves for the consolidation tests are shown on Plate B. Computations utilizing these curves and the recommended safe bearing capacities reveal that the foundations will experience settlements on the order of 1/2 inch and differential settlements of less than 1/4 inch.

Corrosion Design Criteria

Representative samples of the surficial soils, typical of the subgrade soils expected to be encountered within foundation excavations, revealed high levels of sulfate concentrations. The sulfate concentration of the soils tested was 230 and 1,600 parts per million (ppm). Therefore, special cement recommendations are deemed necessary for building foundations at this time. However, additional sulfate testing shall be performed at the conclusion of rough grading operation to verify with these conclusions. Sulfate test results may be found on the attached Table III.

Retaining Wall Design Parameters

Active earth pressures against retaining walls will be equal to the pressures developed by the following fluid densities. These values are for **granular free draining** backfill material placed adjacent to the walls at various ground slopes above the walls.

Surface Slope of Retained Materials (Horizontal to Vertical)	Equivalent Fluid Density (lb./cu.ft.)
Level	30
5 to 1	35
4 to 1	38
3 to 1	40
2 to 1	45

Any applicable short-term construction surcharges and seismic forces should be added to the above lateral pressure values. A backfill zone of non-expansive material shall consist of a wedge beginning a minimum of one horizontal foot from the base of the wall extending upward at an inclination no less than 3/4 to 1 (horizontal to vertical). All walls shall be waterproofed and protected from hydrostatic pressure by a reliable permanent subdrain system.

Slab Recommendations

All concrete slabs-on-grade shall be a minimum of five inches in thickness, reinforced a minimum of No. 4 bars eighteen inches in each direction, positioned in the center of the slab. The project Structural Engineer should review all proposed loads to be imposed for further recommendations regarding slab thickness and steel reinforcement. Any concrete slabs with moisture sensitive floor coverings should be underlain by an impervious membrane. The membrane shall consist of visqueen at least 6 mils in thickness and should be sandwiched between or covered with four inches of sand. All slab areas shall be premoistened to 130% of the optimum moisture content to a depth of eighteen inches prior to pouring concrete. All concrete slab areas to receive floor coverings should be moisture tested to meet all manufacturer requirements prior to placement.

Preliminary Pavement Design

The table below provides a preliminary pavement design based upon an estimated R-Value of 20 for the proposed industrial and retail developments and interior streets. Final pavement design should be based on R-Value testing of the subgrade soils near the conclusion of rough grading to assure that these soils are consistent with those assumed in this preliminary design.

PRELIMINARY ASPHALT PAVEMENT DESIGN

Type of Traffic	Traffic Index	Asphaltic Concrete (in)	Base Material (in)
Automobile Parking Stalls	4.0	3.0	5.0
Automobile Drive Circulation Areas	5.0	3.0	8.0
Medium Truck Access Areas (GVW < 42,000 lbs.; 3 axle)	6.0	3.5	10.0
Heavy Trucks Access Areas (GVW < 90,000 lbs.; 5 axle)	7.0	3.5	14.0
Interior Streets	8.0	4.0	16.5

Any concrete slabs utilized for heavy trucks and forklifts shall be a minimum of six inches in thickness and placed on approved fill soils recompacted to a minimum of 95% relative compaction. Any approved base material shall consist of a Class II aggregate or equivalent and should be compacted to a minimum of 95% relative compaction.

All pavement materials shall conform to the requirements set forth by the City of Los Angeles. The base material and asphaltic concrete should be tested prior to delivery to the site and during placement to assure conformance with the project specifications. A pavement engineer shall designate the specific asphalt mix design to meet the required project specifications.

Limitations

The recommendations and conclusions contained in this report are based upon the geotechnical conditions uncovered in our test excavations. No warranty of the geotechnical condition between our excavations is implied. NorCal Engineering should be notified for possible further recommendations if unexpected or unfavorable conditions are encountered during the construction phase. It is the responsibility of the owner to ensure that all information within this report is submitted to the Architect and appropriate Engineers for the project.

This firm should have the opportunity to review the final plans to verify that all our recommendations are incorporated. This report and all conclusions are subject to the review of the controlling authorities for the project. A preconstruction conference should be held between the developer, general contractor, grading contractor, city inspector, and geotechnical engineer to clarify any questions relating to the subsequent construction. Our representative should be present during the grading operations and construction phase to certify that such recommendations are complied with in the field.

The geotechnical investigation has been conducted in a manner consistent with the level of care and skill exercised by members of our profession currently practicing under similar conditions in the Southern California area. No other warranty, expressed or implied is made.

SPECIFICATIONS FOR PLACEMENT OF COMPACTED FILL

Preparation

Any existing low density soils and/or saturated soils shall be removed to competent natural soil under the inspection of the Soils Engineering Firm. After the exposed surface has been cleansed of debris and/or vegetation, it shall be scarified until it is uniform in consistency, brought to the proper moisture content and compacted to a minimum of 90% relative compaction (in accordance with ASTM: D-1557-78).

Material For Fill

The on-site soils or approved import soils may be utilized for the compacted fill provided they are free of any deleterious materials and shall not contain any rocks, brick, asphaltic concrete, concrete or other hard materials greater than eight inches in maximum dimensions. Any import soil must be approved by the Soils Engineering firm a minimum of 24 hours prior to importation on site.

Placement of Compacted Fill Soils

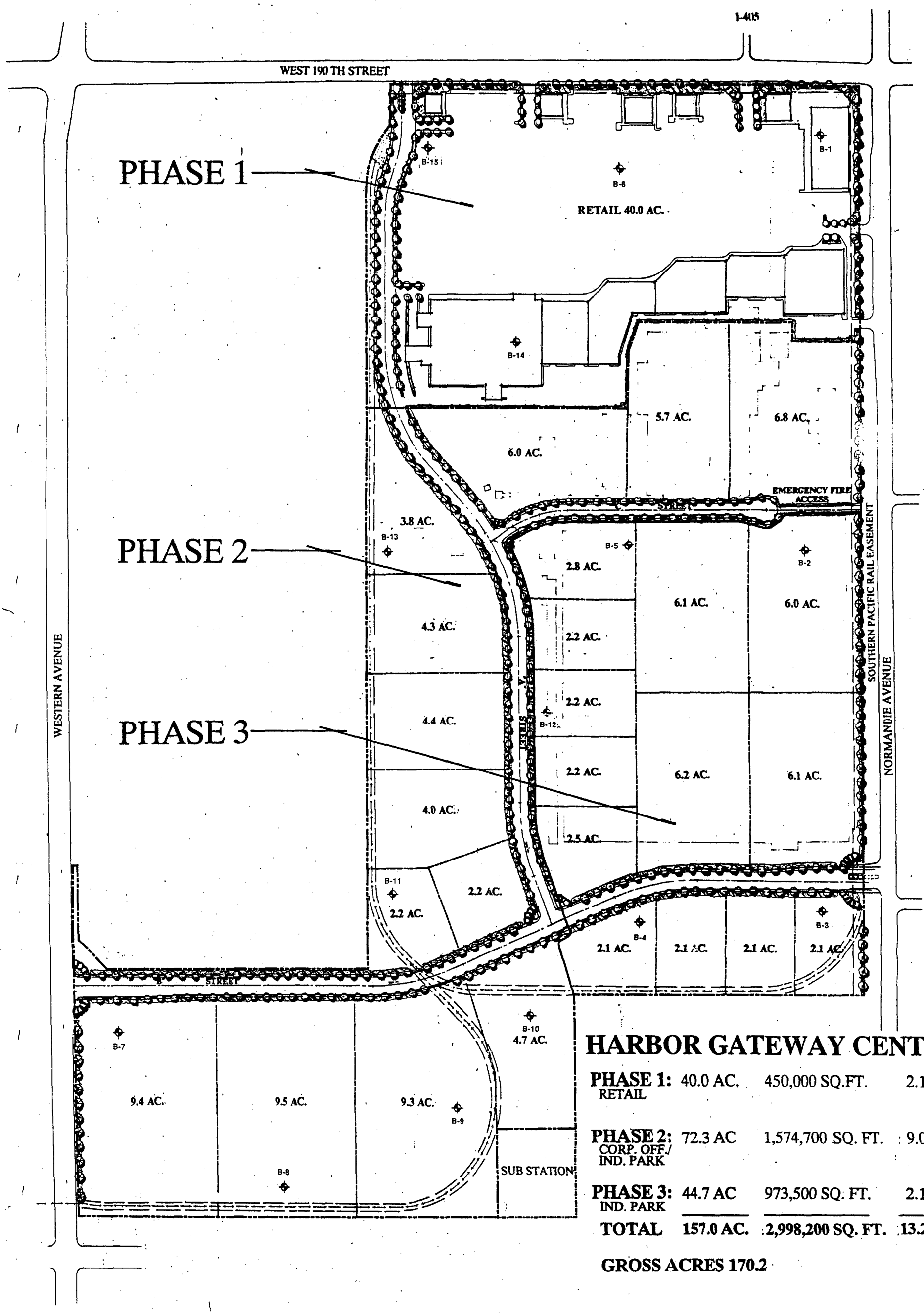
The approved fill soils shall be placed in layers not in excess of six inches in thickness. Each lift shall be uniform in thickness and thoroughly blended. The fill soils shall be brought to within 15% of the optimum moisture content, unless otherwise specified by the Soils Engineering firm. Each lift shall be compacted to a minimum of 90% relative compaction (in accordance with ASTM: D-1557-78) and approved prior to the placement of the next layer of soil. Compaction tests shall be obtained at the discretion of the Soils Engineering firm but to a minimum of one test for every 500 cubic yards placed and/or for every 2 feet of compacted fill placed.

The minimum relative compaction shall be obtained in accordance with accepted methods in the construction industry. The final grade of the structural areas shall be in a dense and smooth condition prior to placement of slabs-on-grade or pavement areas. No fill soils shall be placed, spread or compacted during unfavorable weather conditions. When the grading is interrupted by heavy rains, compaction operations shall not be resumed until approved by the Soils Engineering firm.

Grading Observations

The controlling governmental agencies should be notified prior to commencement of any grading operations. This firm recommends that the grading operations be conducted under the observation of a Soils Engineering firm as deemed necessary. A 24 hour notice must be provided to this firm prior to the time of our initial inspection.

Observation shall include the clearing and grubbing operations to assure that all unsuitable materials have been properly removed; approve the exposed subgrade in areas to receive fill and in areas where excavation has resulted in the desired finished grade and designate areas of overexcavation; and perform field compaction tests to determine relative compaction achieved during fill placement. In addition, all foundation excavations shall be observed by the Soils Engineering firm to confirm that appropriate bearing materials are present at the design grades and recommend any modifications to construct footings.



HARBOR GATEWAY CENTER

PHASE 1: RETAIL	40.0 AC.	450,000 SQ.FT.	2.1 ROAD AC.
PHASE 2: CORP. OFF./ IND. PARK	72.3 AC	1,574,700 SQ. FT.	9.0 ROAD AC.
PHASE 3: IND. PARK	44.7 AC	973,500 SQ. FT.	2.1 ROAD AC.
TOTAL	**157.0 AC.**	**2,998,200 SQ. FT.**	**13.2 ROAD AC.**

GROSS ACRES 170.2

CONCEPT MAP

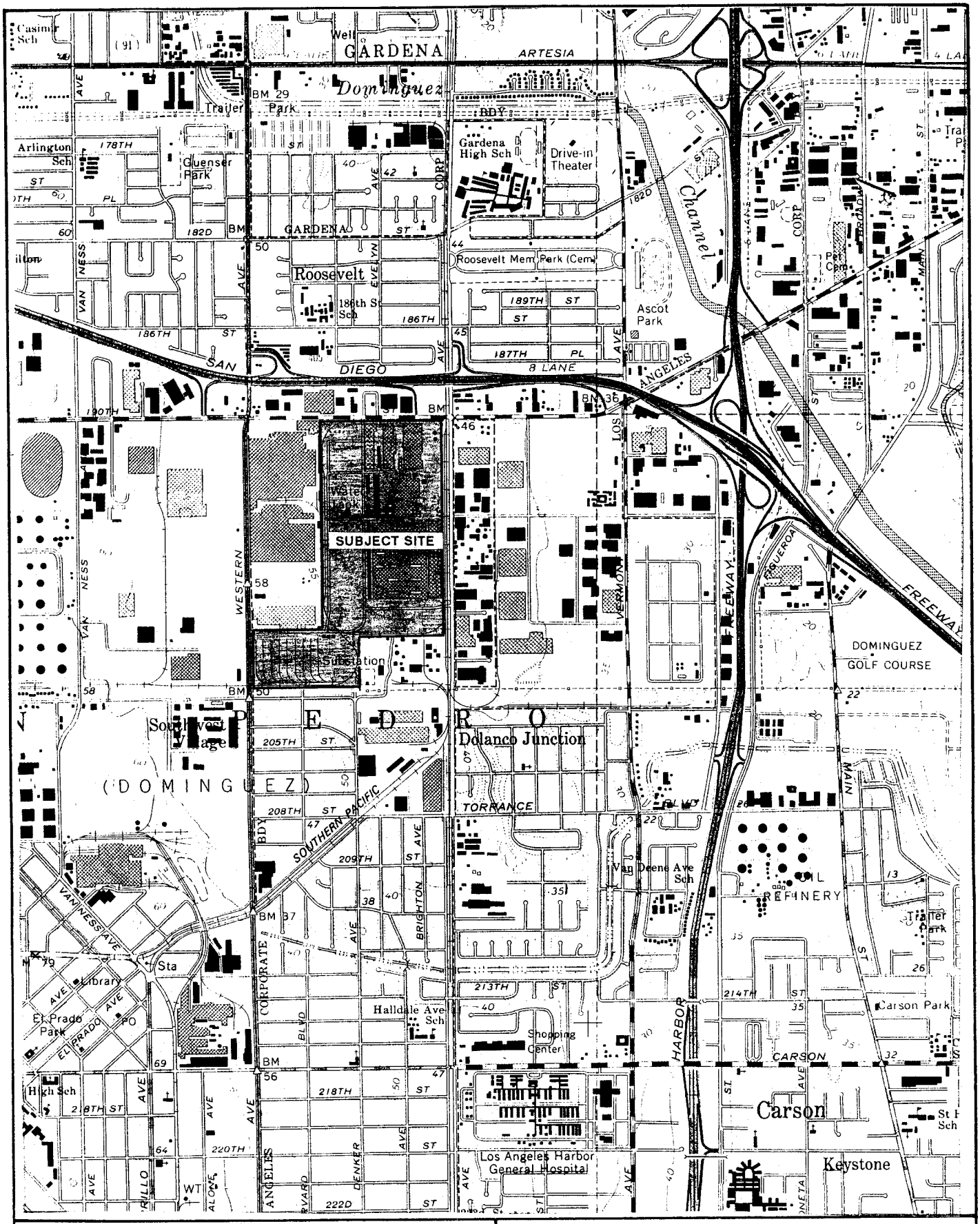
Harbor Gateway Center
McDonnell Douglas Realty Co.

MODIFIED FROM PBR SITE PLAN

NorCal Engineering	SITE PLAN
SOILS AND GEOTECHNICAL CONSULTANTS	APPROXIMATE LOCATION OF FIELD EXPLORATIONS
MCDONNELL DOUGLAS	
PROJECT 5936-96	DATE MARCH 1996

0 100 200 400 FEET
0 25 50 125 METERS

2/28/96



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MCDONNELL DOUGLAS

PROJECT	5936-96	DATE	MARCH 1996

TORRANCE QUADRANGLE
CALIFORNIA–LOS ANGELES CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

March 18, 1996 Project Number 5936-96

APPENDICES

(In order of appearance)

Appendix A - Logs of Test Explorations

* Log of Borings B-1 to B-15

Appendix B - Laboratory Tests

* Table I - Maximum Density Tests
* Table II - Expansion Tests
* Table III - Sulfate Tests

* Plates A and B- Direct Shear Tests
* Plates C and D- Consolidation Tests

NorCal Engineering

Project Number 5936-96

APPENDIX A

NorCal Engineering

MAJOR DIVISIONS			SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS LARGER THAN 200 SIEVE SIZE)	GRAVELS (MORE THAN 50% OF COARSE FRACTION IS LARGER THAN THE NO. 4 SIEVE SIZE)	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES.
			GP	POORLY GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES.
		GRAVELS WITH FINES (APPRECIABLE AMT. OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES.
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES.
	SANDS (MORE THAN 50% OF COARSE FRACTION IS SMALLER THAN THE NO. 4 SIEVE SIZE)	CLEAN SANDS	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES.
			SP	POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES.
		SANDS WITH FINES (APPRECIABLE AMT. OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES.
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES.
FINE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS SMALLER THAN 200 SIEVE SIZE	SILTS AND CLAYS (LIQUID LIMIT LESS THAN 50)		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY.
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS.
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS
	SILTS AND CLAYS (LIQUID LIMIT MORE THAN 50)		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS.
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS.
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

BOUNDARY CLASSIFICATIONS: SOILS POSSESSING CHARACTERISTICS OF TWO GROUPS ARE DESIGNATED BY COMBINATIONS OF GROUP SYMBOLS.

NorCal Engineering
SOILS AND GEOTECHNICAL CONSULTANTS

UNIFIED SOIL CLASSIFICATION SYSTEM

PROJECT | DATE

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.	
17.4	99.9	8/11	R		Artificial Fill Silty CLAY to Clayey SILT, dark brown to brown, stiff, moist, occasional minor gravel and pieces of brick	
23.8	105.3	12/12	R	5	Natural Silty CLAY, dark brown, stiff, moist	
22.8	107.7	7/17	R	10	Silty CLAY, yellowish brown, stiff, moist	
					Sandy SILT, yellowish brown, stiff, moist	
20.2	103.7	9/15	R	15		
33.3	90.4	10/14	R	20		
				25		
				30		
				35		

SAMPLE TYPES

- [C] Rock Core
- [S] Standard Split Spoon
- [R] Ring Sample
- [B] Bulk Sample
- [J] Jar Sample

DATE DRILLED: 3/5/96
EQUIPMENT USED: Simco 2800 HS
GROUNDWATER LEVEL: Not encountered

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SOILS AND GEOTECHNICAL CONSULTANTS

LOG OF BORING #1

PROJECT 5936-96 | DATE

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	Asphalt Pavement (5 1/2" thick) Base Material (5" thick)	48
					Artificial Fill Silty CLAY, dark brown, stiff, moist	
17.9	101.8	8/13	R	5	Natural Silty CLAY, brown, stiff, moist	
				10		
				15		
				20		
				25		
				30		
				35		

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

SAMPLE TYPES

- [C] Rock Core
- [S] Standard Split Spoon
- [R] Ring Sample
- [B] Bulk Sample
- [J] Jar Sample

DATE DRILLED: 3/5/96
EQUIPMENT USED: Simco 2800HS
GROUNDWATER LEVEL: Not encountered

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

PROJECT 5936-96 | DATE

LOG OF BORING #2

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.	
					Asphalt Pavement (6" thick)/Base Material (8" thick)	48
					Artificial Fill Silty CLAY, dark brown, stiff, moist	
20.2	105.4	6/7	R	5	Natural Silty CLAY, dark brown, stiff, moist	
14.7	117.5	9/25	R	10	Sandy SILT, yellowish brown, stiff, moist	
				15		
				20		
				25		
				30		
				35		

SAMPLE TYPES

- [C] Rock Core
- [S] Standard Split Spoon
- [R] Ring Sample
- [B] Bulk Sample
- [J] Jar Sample

DATE DRILLED: 3/5/96
EQUIPMENT USED: Simco 2800HS
GROUNDWATER LEVEL: Not encountered

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

LOG OF BORING #3

PROJECT 5936-96 | DATE

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.	
15.2	101.9	8/11	R		Asphalt Pavement (5" thick)/Base Material (7" thick)	51
					Artificial Fill Silty CLAY, dark brown, stiff, moist, occasional small gravel	
				5	Natural Silty CLAY, dark brown, stiff, moist	
14.7	109.6	12/13	R		Sandy SILT, yellowish brown, stiff, moist	
				10		
				15		
				20		
				25		
				30		
				35		

SAMPLE TYPES

- [C] Rock Core
- [S] Standard Split Spoon
- [R] Ring Sample
- [B] Bulk Sample
- [J] Jar Sample

DATE DRILLED: 3/5/96
EQUIPMENT USED: Simco 2800HS
GROUNDWATER LEVEL: Not encountered

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

PROJECT : 5936-96 | DATE

LOG OF BORING #4

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	Asphalt Pavement(5" thick)/Base Material (6"thick)	51
16.2	105.4	14/15	B/R		Natural Silty CLAY, dark brown, stiff, moist	
15.0	115.2	17/19	R	5	Clayey SILT, yellowish brown, stiff, moist	
15.4	113.0	7/12	R	10		
19.0	102.9	8/15	R	15		
					Sandy SILT, yellowish brown, stiff, moist	
16.1	109.5	7/15	R	20		
					SAND, fine grained, silty, tannish brown, dense, moist	
16.4	114.7	25/36	R	25		
11.6	106.3	13/26	R	30		
9.4	100.8	26/35	R	35	(continued on next page)	

SAMPLE TYPES

- [C] Rock Core
- [S] Standard Split Spoon
- [R] Ring Sample
- [B] Bulk Sample
- [J] Jar Sample

DATE DRILLED: 3/5/96
EQUIPMENT USED: Simco 2800HS
GROUNDWATER LEVEL: Not encountered

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

LOG OF BORING #5

PROJECT 5936-96 | DATE

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				35	THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.	
10.7	110.7	24/37	R	40	Natural SAND, fine grained, silty, tannish brown, dense, moist	
				45	SAND, fine grained, clayey, brown, dense, moist	
15.6	112.7	25/35	R	50	END OF BORING	
				55		
				60		
				65		
				70		

SAMPLE TYPES

- [C] Rock Core
- [S] Standard Split Spoon
- [R] Ring Sample
- [B] Bulk Sample
- [J] Jar Sample

DATE DRILLED: 3/4/96
EQUIPMENT USED: Simco 2800HS
GROUNDWATER LEVEL: Not encountered

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

LOG OF BORING #5 contd.

PROJECT 5936-96 **DATE**

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.	
					Asphalt (6" thick)/Base Material (6" thick)	51
					Artificial Fill Silty CLAY to Clayey SILT, dark brown to yellowish brown, firm to stiff, moist	
20.8	102.7	7/13	R	5	Natural Silty CLAY, dark brown, stiff, moist	
15.9	110.9	12/15	R	10	Clayey SILT, yellowish brown, stiff, moist	
				15	Sandy SILT, yellowish brown, stiff, moist	
				20		
				25		
				30		
				35		

SAMPLE TYPES

- [C] Rock Core
- [S] Standard Split Spoon
- [R] Ring Sample
- [B] Bulk Sample
- [J] Jar Sample

DATE DRILLED: 3/5/96
EQUIPMENT USED: Simco 2800HS
GROUNDWATER LEVEL: Not encountered

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

LOG OF BORING #6

PROJECT 5936-96 | DATE

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.	
17.9	103.2	8/13	R	0	Artificial Fill Silty CLAY, dark brown, soft, very moist	55
				3	Natural Silty CLAY, dark brown, stiff, moist	
				5	Clayey SILT, yellowish brown, stiff, moist	
14.8	114.1	17/20	R	10	Sandy SILT, yellowish brown, stiff, moist	
16.0	113.7	10/12	R	20		
				25	SAND, fine grained, silty, tannish brown, dense, moist	
11.2	105.9	15/21	R	30		
				35		

SAMPLE TYPES

- [C] Rock Core
- [S] Standard Split Spoon
- [R] Ring Sample
- [B] Bulk Sample
- [J] Jar Sample

DATE DRILLED: 3/5/96
EQUIPMENT USED: Simco 2800HS
GROUNDWATER LEVEL: Not encountered

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

LOG OF BORING #7

PROJECT 5936-96 | DATE

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	Artificial Fill Silty CLAY to Clayey SILT, dark brown, firm moist with minor pieces of asphalt and gravel	
20.8	108.9	8/13	R	5	Natural Silty CLAY, dark brown, stiff, moist	
24.3	99.4	6/17	R	10	Clayey SILT, yellowish brown, stiff, moist	
9.9	118.6	14/21	R	15	Sandy SILT, yellowish brown, stiff, moist	
12.9	123.4	27/43	R	20	Clayey SILT, yellowish brown, stiff, moist	
				25		
				30		
				35		

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

SAMPLE TYPES

- [C] Rock Core
- [S] Standard Split Spoon
- [R] Ring Sample
- [B] Bulk Sample
- [J] Jar Sample

DATE DRILLED: 3/5/96
EQUIPMENT USED: Simco 2800HS
GROUNDWATER LEVEL: Not encountered

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

LOG OF BORING #8

PROJECT 5936-96 | DATE

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.	
					Artificial Fill Silty CLAY to Clayey SILT, dark brown to yellowish brown, firm, moist	48
				5	Natural Silty CLAY, dark brown, stiff, moist	
					Clayey SILT, yellowish brown, stiff, moist	
				10		
				15		
				20		
				25		
				30		
				35		

SAMPLE TYPES

- [C] Rock Core
- [S] Standard Split Spoon
- [R] Ring Sample
- [B] Bulk Sample
- [J] Jar Sample

DATE DRILLED: 3/13/96
EQUIPMENT USED: Hand Auger
GROUNDWATER LEVEL: Not encountered

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

LOG OF BORING #9

PROJECT 5936-96 | DATE

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.	
17.1	102.7		R	0	Artificial Fill Silty CLAY, dark brown, soft, moist	
				5	Natural Silty CLAY, dark brown, stiff, moist	
					Clayey SILT, yellowish brown, stiff, moist	
20.7	103.9		R	10		
				15		
				20		
				25		
				30		
				35		

SAMPLE TYPES

- [C] Rock Core
- [S] Standard Split Spoon
- [R] Ring Sample
- [B] Bulk Sample
- [J] Jar Sample

DATE DRILLED: 3/13/96
EQUIPMENT USED: Hand Auger
GROUNDWATER LEVEL: Not encountered

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

PROJECT 5936-96 | DATE

LOG OF BORING #10

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	Asphalt Pavement (2 1/2" thick)/Base Material (6" thick)	52
					Artificial Fill Silty CLAY, dark brown, stiff, moist	
				5	Natural Silty CLAY, dark brown, stiff, moist	
				10	Clayey SILT, yellowish brown, stiff, moist	
				15		
				20		
				25		
				30		
				35		

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

SAMPLE TYPES

- [C] Rock Core
- [S] Standard Split Spoon
- [R] Ring Sample
- [B] Bulk Sample
- [J] Jar Sample

DATE DRILLED: 3/5/96
EQUIPMENT USED: Simco 2800HS
GROUNDWATER LEVEL: Not encountered

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

LOG OF BORING #11

PROJECT 5936-96 | DATE

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.	
				0	Asphalt Pavement (4 1/2" thick)/Base Material (3" thick)	51
19.7	103.7	7/15	R		Natural Silty CLAY, dark brown, stiff, moist	
				5		
19.9	101.8	10/12	R		Clayey SILT, yellowish brown, stiff, moist	
24.7	102.7	11/17	R	10		
				15	Sandy SILT, yellowish brown, stiff, moist	
13.2	114.7	17/24	R	20		
				25		
				30		
				35		

SAMPLE TYPES

- [C] Rock Core
- [S] Standard Split Spoon
- [R] Ring Sample
- [B] Bulk Sample
- [J] Jar Sample

DATE DRILLED: 3/5/96
EQUIPMENT USED: Simco 2800HS
GROUNDWATER LEVEL: Not encountered

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

LOG OF BORING #12

PROJECT 5936-96 | DATE

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.	
					Artificial Fill Silty CLAY, brown, soft, very moist	
				5	Natural Silty CLAY, dark brown, stiff, moist	
				10	Clayey SILT, yellowish brown, stiff, moist	
				15		
				20		
				25		
				30		
				35		

SAMPLE TYPES

- [C] Rock Core
- [S] Standard Split Spoon
- [R] Ring Sample
- [B] Bulk Sample
- [J] Jar Sample

DATE DRILLED: 3/13/96
EQUIPMENT USED: Hand Auger
GROUNDWATER LEVEL: Not encountered

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

LOG OF BORING #13

PROJECT 5936-96 | DATE

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.	
					Asphalt Pavement (5 1/2" thick)/Base Material (2 1/2" thick)	50
				5	Natural Silty CLAY, dark brown, stiff, moist	
					Clayey SILT, yellowish brown, stiff, moist	
				10	Sandy SILT, yellowish brown, stiff, moist	
				15		
				20		
				25		
				30		
				35		

SAMPLE TYPES

- [C] Rock Core
- [S] Standard Split Spoon
- [R] Ring Sample
- [B] Bulk Sample
- [J] Jar Sample

DATE DRILLED: 3/5/96
EQUIPMENT USED: Simco 2800HS
GROUNDWATER LEVEL: Not encountered

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

LOG OF BORING#14

PROJECT 5936-96 | DATE

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	Asphalt Pavement (3 1/2" thick)/Base Material (4" thick)	51
14.0	111.7	11/14	R/B		Natural Silty CLAY, dark brown, stiff, moist	
				5	Clayey SILT, yellowish brown, stiff, moist	
				10		
				15		
				20		
				25		
				30		
				35		

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

SAMPLE TYPES

- [C] Rock Core
- [S] Standard Split Spoon
- [R] Ring Sample
- [B] Bulk Sample
- [J] Jar Sample

DATE DRILLED: 3/5/96
EQUIPMENT USED: Simco 2800HS
GROUNDWATER LEVEL: Not encountered

NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

LOG OF BORING #15

PROJECT 5936-96 | DATE

Project Number 5936-96

APPENDIX B

NorCal Engineering

TABLE I
MAXIMUM DENSITY TESTS
(ASTM: D-1557-78)

Sample	Classification	Optimum Moisture	Maximum Dry Density (lbs./cu.ft.)
B1 @ 2'	Silty CLAY	14.0	110.0
B5 @ 2'	Silty CLAY	13.0	112.0
B15 @ 3'	Clayey SILT	12.0	121.0

TABLE II
EXPANSION INDEX TESTS
(U.B.C. STD. 29-2)

Sample	Classification	Expansion Index
B1 @ 2'	Silty CLAY	60
B5 @ 2'	Silty CLAY	53
B15 @ 3'	Clayey SILT	37

TABLE III
SULFATE TEST RESULTS

Sample	Sulfate Concentrations (ppm)
B1 @ 2'	1,600
B5 @ 2'	230

ppm: mg/kg

Calscience
Environmental
Laboratories, Inc.

ACCREDITED

ANALYTICAL REPORT

Norcal Engineering, Inc.	Date Sampled:	03/06/96
10641 Humbolt Street	Date Received:	03/14/96
Los Alamitos, CA 90720	Date Analyzed:	03/15/96
	Work Order No.:	96-03-248
Attn: Scott Spensiero	Method:	EPA 9038
RE: McDonald Douglas/5936-96	Page 1 of 1	

All concentrations are reported in mg/kg (ppm).

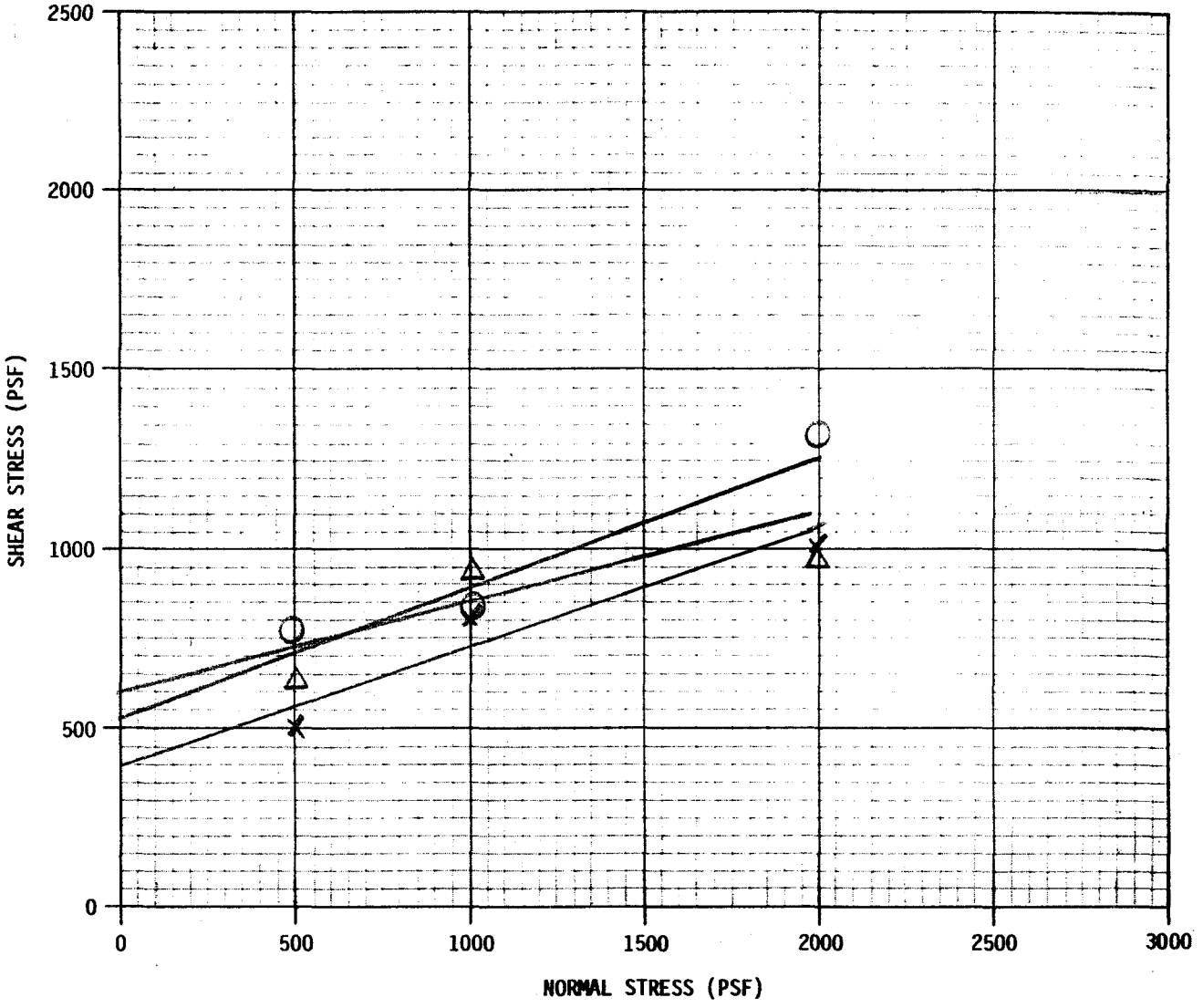
Sample Number	Sulfate Concentration	Reportable Limit
#1	1600	100
#2	230	20

Reviewed and Approved _____ on 03/15/1996
William H. Christensen
Deliverables Manager

ND denotes not detected at indicated reportable limit.

Each sample was received by CEL chilled, intact, and with chain-of-custody attached.

7440 Lincoln Way, Garden Grove, CA 92641-1432 • TEL: (714) 895-5494 • FAX: (714) 894-7501



SYMBOL	BORING NUMBER	DEPTH (FEET)	ø (DEGREES)	C (PSF)	DRY DENSITY (PCF)	MOISTURE CONTENT (%)
X	1	2.0	17	400	99.9	17.4
○	5	2.5	19	550	105.4	16.2
△	7	3.0	13	600	103.2	17.9
□						

NOTE: TESTS PERFORMED ON SATURATED SAMPLES UNLESS SHOWN BELOW.
(FM) FIELD MOISTURE
TESTS PERFORMED ON UNDISTURBED SAMPLES UNLESS SHOWN BELOW.
(R) SAMPLES REMOLDED AT 90% OF MAXIMUM DRY DENSITY

NorCal Engineering
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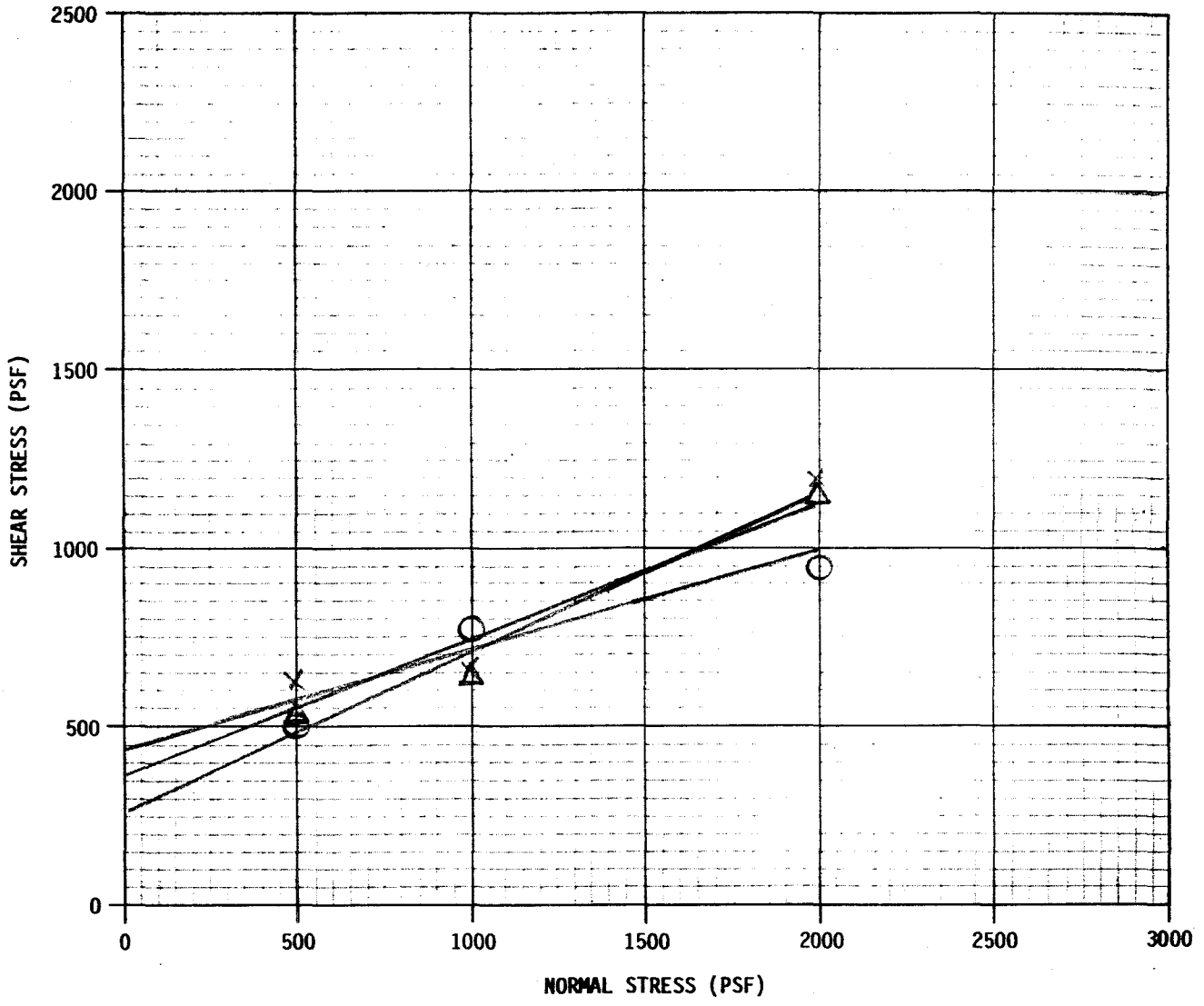
PROJECT 5936-96 | DATE

DIRECT SHEAR TEST RESULTS
PLATE A



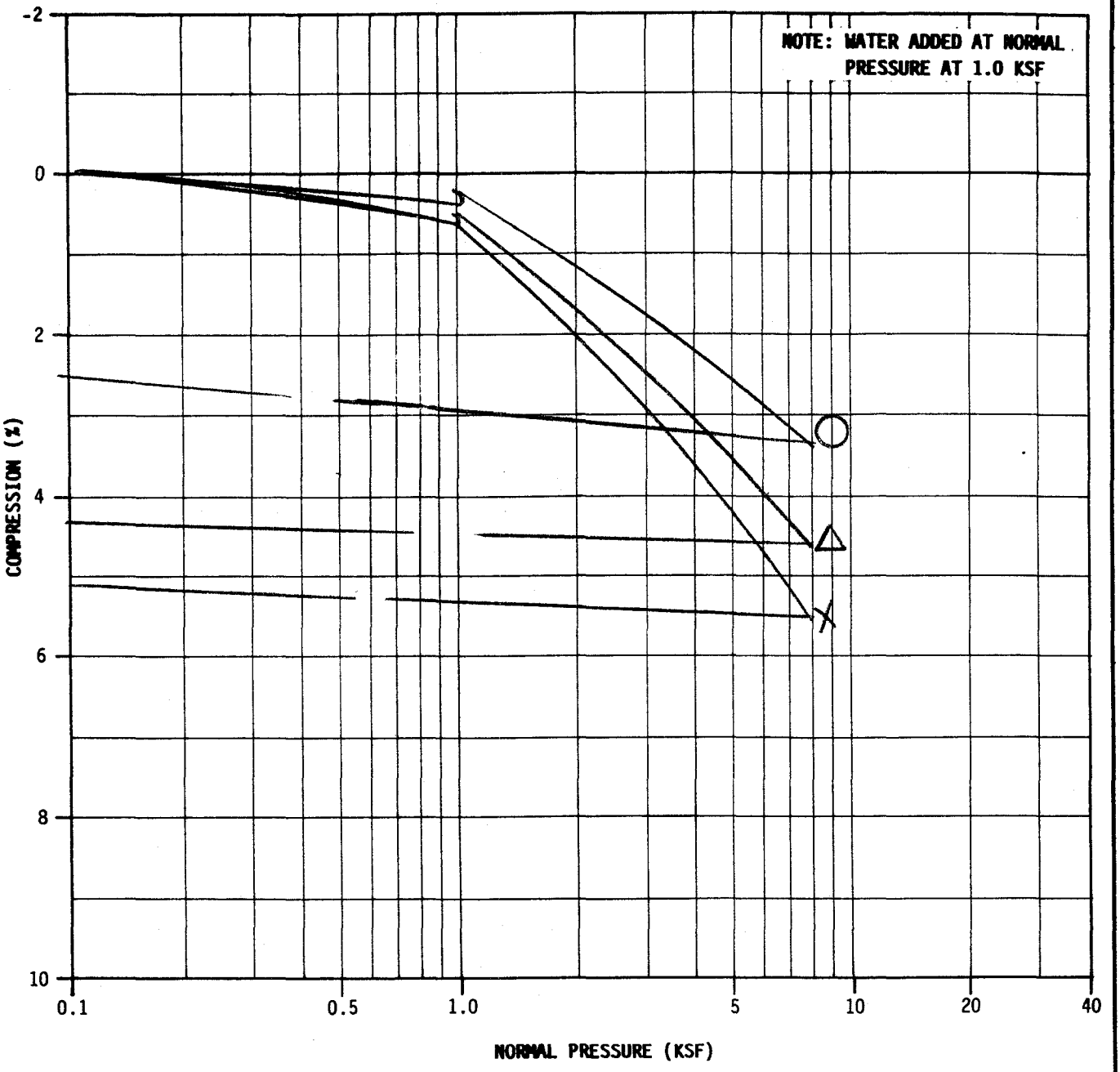
SYMBOL	BORING NUMBER	DEPTH (FEET)	ø (DEGREES)	C (PSF)	DRY DENSITY (PCF)	MOISTURE CONTENT (%)
X	10	2.0	20	375	102.7	17.1
O	12	2.5	15	450	103.7	19.7
△	15	3.5	23	275	111.7	14.0
□						

NOTE: TESTS PERFORMED ON SATURATED SAMPLES UNLESS SHOWN BELOW.
(FM) FIELD MOISTURE
TESTS PERFORMED ON UNDISTURBED SAMPLES UNLESS SHOWN BELOW.
(R) SAMPLES REMOLDED AT 90% OF MAXIMUM DRY DENSITY

NorCal Engineering
SOILS AND GEOTECHNICAL CONSULTANTS

PROJECT 5936-96 | DATE

DIRECT SHEAR TEST RESULTS
PLATE B



SYMBOL	BORING NUMBER	DEPTH (FEET)	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)
X	1	2.0	90.4	33.3		
○	3	10	117.5	14.7		
△	5	15	102.9	19.0		
□						

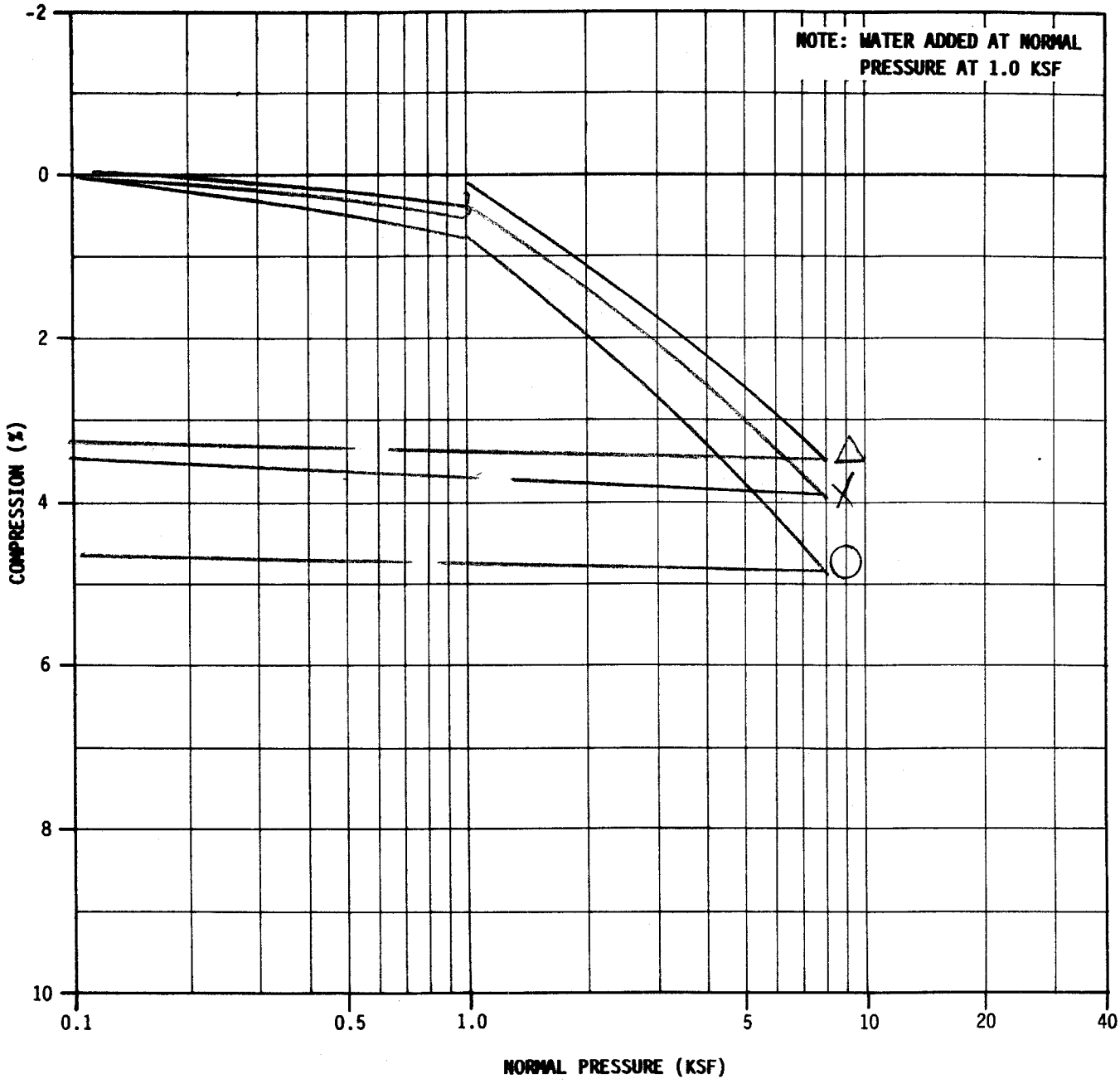
——— COMPRESSION (FM) FIELD MOISTURE - NO WATER ADDED

– – – – REBOUND (R) SAMPLE REMOLDED AT 90% OF MAXIMUM DRY DENSITY

NorCal Engineering
SOILS AND GEOTECHNICAL CONSULTANTS

PROJECT 5936-96 DATE

CONSOLIDATION TEST RESULTS
PLATE C



SYMBOL	BORING NUMBER	DEPTH (FEET)	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)
X	8	5	108.9	20.8		
○	10	7.5	101.8	19.9		
△	15	3.5	111.7	14.0		
□						

——— COMPRESSION (FM) FIELD MOISTURE - NO WATER ADDED

– – – REBOUND (R) SAMPLE REMOLDED AT 90% OF MAXIMUM DRY DENSITY

NorCal Engineering
SOILS AND GEOTECHNICAL CONSULTANTS

PROJECT 5936-96 | DATE

CONSOLIDATION TEST RESULTS
PLATE D